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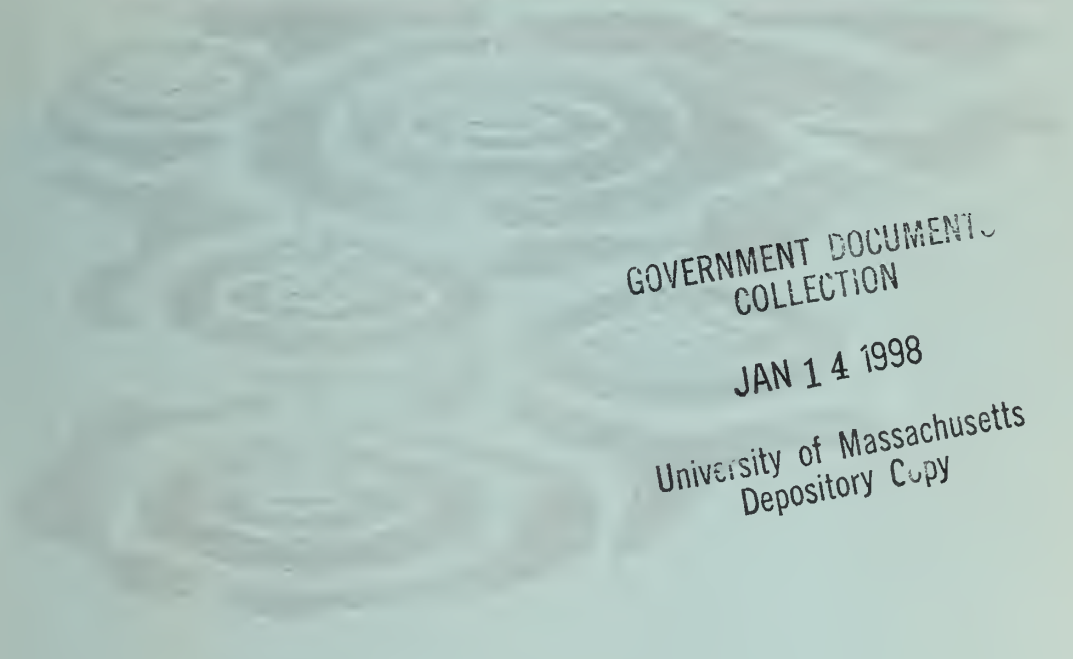
Non-Regulatory Strategies for Protection of Surface Drinking Water Supplies



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Non - Regulatory Strategies for Protection of Surface Drinking Water Supplies

Task 4
Massachusetts Department of Environmental Protection
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I. Introduction

In recent years federal and state legislation has placed new demands on water suppliers, requiring multiple safeguards for the protection of public drinking water supplies. The Safe Drinking Water Act (SDWA) and the Surface Water Treatment Rule (SWTR) establish water quality standards and acceptable treatment levels to insure the public receives safe drinking water. Increasingly, communities have found it difficult or costly to comply with the various federal and state requirements. This is especially true in communities, many of them small communities, where water suppliers do not have enterprise accounts, where tax bases may be limited to residential development and where Proposition 2 1/2 tax overrides are unacceptable. In recent years emphasis has been placed on protection of water supply sources as a cost-effective way to comply with state and federal requirements as well as to provide safe drinking water.

The Massachusetts Department of Environmental Protection (DEP) has been in the forefront in recognizing the importance of source protection. DEP recommends that all surface water suppliers develop a comprehensive surface water supply protection strategy based on the requirements of a Watershed Resource Protection Plan. A Watershed Resource Protection Plan presents a comprehensive approach for protection of surface water supplies based on the natural characteristics of the watershed and the type and number of land uses that pose threats to those supplies. Components of a Watershed Resource Protection Plan include background on the water supply system, description of the geological, geographical, and hydrological characteristics of the watershed, identification and assessment of water quality threats, a recommended program to eliminate or minimize those threats, a description of water quality monitoring and a description of system operations and management. Originally developed to allow water suppliers to "waive" the filtration requirement mandated under the SWTR, Watershed Resource Protection Plans are excellent planning tools for developing comprehensive surface water supply protection strategies. (DEP prepared a "Guidance Document on the Preparation of a Watershed Resource Protection Plan" [D.W.S. Policy 89-09, January 1990] which describes how to prepare an effective watershed control program.)

A key item of a Watershed Resource Protection Plan is the recommended control measures to remove or minimize threats to water supply sources. These measures typically include Best Management Practices, local regulations or laws, such as zoning laws, efforts to gain control of watershed lands through ownership interests, or site specific mitigation measures. The most successful watershed protection programs will use all or a combination of these measures. This document focuses on ***non-regulatory measures*** that water suppliers or communities can use to protect surface water supplies. The term non-regulatory measures is used to describe those actions that water suppliers and communities can take that do not necessarily require the passage of a local bylaw or ordinance. For the most part these actions can be implemented as management strategies by water departments or by cooperating with other municipal departments.

The Pioneer Valley Planning Commission (PVPC) is the regional planning agency for Hampden and Hampshire Counties. PVPC has worked intensively with area communities over the past decade protecting drinking water supplies. Funding for this project and report was provided by a grant from the United States Environmental Protection Agency (EPA) through DEP, through section 604(b) of the Clean Water Act, task 4 of contract 94-04.

Protection of water supplies, especially in large areas such as watersheds, must be ongoing. The methods to achieve efficient resource protection are ever-changing and evolving. New uses, such as the creation of a new farm field or subdivision, may require new monitoring efforts or new Best Management Practices. Furthermore, the means for obtaining data and information are changing and improving. Effective watershed protection requires the constant and regular inspection of watershed lands and uses and the constant evaluation and assessment of control measures. The items contained in this report should be considered as some of the tools available to assist communities in preparing and implementing a comprehensive, ongoing water supply protection strategy.

II. Summary of Threats to Surface Water Supplies

Numerous natural characteristics of the watershed and human activities within the watershed may be potentially detrimental to water quality. The major threats to water supply sources are listed and summarized below. A greater description of these threats may be found in DEP's "The Megamanual: Nonpoint Source Management Manual: A Guidance Document for Municipal Officials."

Naturally occurring attributes in watershed areas which may be detrimental to water quality include:

- Soil Erosion and Sedimentation
- Wildlife Populations

Human Activities within watershed areas which may be detrimental to water quality:

- Commercial and Industrial Land Use
- Activities Subject to State or Federal Approval
- Forestry Activities
- Animal Rearing/Agricultural Activities
- Residential Development Use
  - Household Pesticide/Fertilizer Use
  - Household Hazardous Material
- Gasoline Stations and Petroleum Storage
- Sand and Gravel Mining
- Golf Courses
- Sewage Disposal
  - Sewered Areas
  - On-site Septic Disposal
- Road Salt Storage and Application
- Hazardous Waste Sites
- Unauthorized Activities
- Transportation, Airports and Roadway Related
- Future Development

The goal of a comprehensive watershed protection strategy is to remove as many of these threats as possible from watershed areas or minimize the effects from those that cannot be removed through a series of regulatory, management, or other control measures.

Natural Contamination Sources

Soil Erosion and Sedimentation - Soil erosion and sedimentation can decrease water clarity, increase turbidity levels, and may transport toxic substances and nutrients. This may result in reduced reservoir capacity, increased algal growth, damage to water treatment pumps and equipment, and, ultimately, increased treatment costs. Soil erosion is a function of four variables: soil type, topography, land use, and soil cover. Soil type and topography, for all practical purposes, remain constant unless there is major excavating or re-grading. Land use and soil cover is variable and can change rapidly, for instance, with a clear-cut forestry operation or the conversion of land from forestry to agricultural use. Land use and soil cover may change as a result of natural processes, such as fire, floods, or severe storms, or human activities, such as development, resource extraction, or forestry. The effects from natural processes are difficult to control. The effects from human activities can be minimized through Best Management Practices or other land use controls.

Wildlife Populations - Large populations of wildlife in close proximity to surface waters can threaten water quality, primarily through the introduction of pathogens, including bacteria, viruses, and protozoa, to the water supply. *Giardia lamblia*, usually associated with beaver populations, fecal coliform from waterfowl populations and Cryptosporidium from large animals are some of the more common contaminants associated with wildlife populations. Approved wildlife management programs should be developed to control wildlife population in watershed areas.

Man-Made Contamination Sources

Commercial and Industrial Land Use - A wide range of commercial and industrial land uses can present threats to water supplies. These uses may use, store, generate, treat, transport, or dispose of a wide range of materials that can contaminate water. These may be permitted and regulated through a state or federal permits or they may be unregulated, either illegally, or because they do not meet minimum permitting requirements. Almost any type of commercial or industrial land use is a threat to water supplies. Some of the major threats are contaminated runoff from parking lots, spillage or other accidents occurring during the transport or transfer of material, such as gasoline or oil, illegal disposal, "dumping" of oils or cleaners, or disposal of cleaning materials to septic systems. New commercial and industrial uses in watershed areas should be regulated through zoning. Zoning can prohibit new uses or impose environmental performance standards via special permit or site plan review provisions. Existing land uses should be monitored closely. Board of Health regulations can be used to regulate existing uses.

Activities Subject to State or Federal Approval - There are many land uses and activities that require a state or federal permit to store, use, generate, transport or use hazardous material. Permitted activities include: permits to discharge to surface waters under the National Pollution Discharge Elimination System (NPDES); permits to discharge directly to groundwater; permits for large and small quantity generators of hazardous waste through the Resource Conservation and Recovery Act (RCRA); and solid waste facilities. New land uses requiring these permits should be prohibited in watershed areas. Existing land uses in watershed areas that require any of these permits should be regularly monitored and inspected

Forestry Activities - Timber harvesting can be one of the most predominant uses in watershed areas. Yet, timber harvesting can cause negative impacts to water quality through increased soil erosion or inadvertent releases of hydrocarbons. If not properly managed, forestry practices may accelerate erosion by stripping soil of its cover of organic matter and litter and by compaction of soil from heavy equipment traffic. These changes in soil cover conditions reduce the amount of rainfall and snow melt that can infiltrate into the soil. The resulting increases in both the volume of runoff and the velocity of overland flow can cause significant soil erosion.

Removal of trees can change a watershed in a variety of ways. Reduction of leaf cover changes soil moisture loss due to evapotranspiration. Tree tops also reduce the impact of falling rain as it passes through the branches and leaves. Removal of large stands of coniferous trees can cause accelerated melting of snow cover in the spring, which may also result in soil erosion. Trunk removal, which requires the use of heavy equipment on roads and skidding trails has the greatest potential for causing soil erosion. Stream crossings, wetlands, and areas with steep slopes are areas that are especially vulnerable to damage during logging activities. Heavy equipment use can also result in accidental spills or releases of fuel or oil.

Forestry activities should be carried out according to management plans designed for the timber stands present within the watershed. All forestry practices in watershed areas should be closely monitored and controlled. Particular care should be taken to maintain ground cover and existing forest canopies.

Animal Rearing / Agricultural Activities - Agricultural uses can also be predominant land uses in undeveloped watershed areas. There are numerous threats to water supplies associated with agricultural land uses. Contamination of water supplies can result from the improper application, storage, or mixing of pesticides or herbicides, many of which can be carcinogenic and directly impact public health. Nutrient contamination of water sources can result from excessive fertilizer and manure application. Soil erosion and sedimentation may occur from tillage practices, especially on steep slope areas or where the soil is highly erodible. Nutrient and pathogen contamination may result from feedlots, animal rearing areas, and manure pits when contaminated leachate enters water supplies. The storage, disposal, and use of fluids, oils, and gasoline for farm machinery operation and maintenance are also potential threats to water supplies. Agricultural practices should be monitored and inspected regularly, especially because agricultural practices change frequently, often yearly, if not seasonally.

Residential Development - Residential development can threaten surface water supplies by changing drainage patterns, increasing erosion and sedimentation, contamination from septic systems, increasing impervious surfaces and accompanying stormwater runoff, nutrient and pathogen contamination from pets and livestock, leaks or spills from above and below ground tanks for hazardous materials such as home heating oil, hazardous material disposal from a wide range of household hazardous waste, nutrient and pesticide contamination from lawn fertilizer and pesticide applications, and elevated sodium levels from snow and ice removal. The risk from a single residential use is generally lower than from an industrial, commercial or agricultural use because the scale is generally smaller. Amounts of hazardous materials are generally less and areas covered are generally smaller. Large subdivisions in watershed areas can, however, increase the risk to water supplies. Also, the average homeowner might not be as knowledgeable about the potential risks associated with the above mentioned threats as a commercial, industrial, or agricultural operator. Consequently, in some instances, the risks may be greater with residential uses than with commercial, industrial, or agricultural uses. Educational programs to homeowners are effective measures of minimizing the risks of water supply contamination from residential uses.

Sewage Disposal

Sewered Areas - Municipal sewers in watershed areas can discharge large volumes of untreated wastewater to surface water supplies should breaks or leaks in sewer lines develop. Sewer lines can increase the development potential of undeveloped, and potentially undevelopable, land as well, introducing the threats from developed land uses. Close coordination between water and sewer departments should be maintained before infrastructure expansion is undertaken.

On-site Septic Disposal - Properly functioning septic systems remove solids and pathogens from wastewater by allowing the solids to settle out and distributing wastewater into leach fields, where it is further treated by soil and specialized microorganisms. Conventional septic systems cannot remove toxins and many of the by-products of waste decomposition, particularly nitrates. Innovative and alternative technology systems have increased ability for pollutant removal, such as enhanced nitrogen removal. The greatest threat from septic systems is from the disposal of toxic chemicals through the system. Cleaning fluids, tank cleaning agents, water-softeners, and other chemical disposal can contribute to the contamination of groundwater and ultimately surface waters. Nitrates are not treated by the soil. Being both carcinogenic and a cause of methemoglobinemia, a potentially fatal blood condition, nitrates represent a public health hazard, especially for infants and the frail elderly, when they are present in drinking water. Nitrates also contribute to the eutrophication of water bodies by providing excessive nutrients and encouraging algae growth. Another threat to water quality from septic systems is from the discharge of untreated effluent from failed or improperly designed systems. Failed systems could allow overland flow of raw septage to contaminate tributaries of the reservoir.

Gasoline Stations and Petroleum Storage - Gasoline stations and automotive service and repair facilities may cause water supply contamination from improper storage, use and disposal of hazardous materials,(such as waste oil, fuel, antifreeze, solvents, used filters, and used batteries), contaminated stormwater runoff, and accidental spills and leaks. Fuel stations, large fuel depots and tank farms are also a threat to groundwater supplies from potential leaks and accidental spills from underground fuel storage systems. New gasoline stations should not be permitted in watershed areas. Existing stations should be monitored closely.

Great strides have been made recently to make “safe” storage tank systems, such as developing monitoring systems and alarms, using non-corrodible materials, employing fail-safe installations, or implementing spill containment measures. However, storage tanks are still threats to water quality because of the ever-present threat of leaks or spills when the tank is filled or materials dispensed. Of particular concern are unregulated tanks, such as household underground storage tanks that contain heating oil. These tanks are often not monitored and are ignored by the tankowner until a leak or other contamination incident occurs. The installation of new underground storage tanks for petroleum products should be prohibited in watershed areas. Above ground tanks should be made to comply with strict environmental performance standards to contain spills and leaks. Old underground storage tanks in watershed areas should be removed.

Road Salt Storage and Application - The storage and application of road salt and other de-icing materials are threats to surface waters from the runoff of a contaminated leachate, a “brine,” high in sodium concentrations. The application of salt on highways has contaminated numerous private wells in Massachusetts and can threaten surface water supplies as well. Excessive salt applications can also harm vegetation and farm crops adjacent to highways, leading to an increase in erosion and sedimentation. Salt storage areas should be prohibited or eliminated in watershed areas. Where this is not possible, salt storage and loading areas should be covered and built on impervious surfaces with drainage systems designed to minimize runoff. Municipal road salt policies should be developed which minimize the adverse impacts from applications of road salts while still maintaining safe driving conditions. Municipal road salt policies, involving cooperation from numerous town boards and departments, should include the elimination or reduction of salt applications, using alternatives to sodium chloride such as calcium chloride or calcium magnesium acetate, frequent calibration of equipment, careful timing of applications of salt mixtures and increased frequency of road sweeping, or, preferably, road vacuuming.

Hazardous Waste Sites - The Massachusetts Department of Environmental Protection maintains a list of confirmed and remedial hazardous waste sites. These are areas where hazardous material (defined as material that because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious or radioactive characteristics is a present or potential threat to human health, safety, welfare, or the environment) has been spilled, leaked, poured, abandoned, emitted, emptied, discharged, injected, leached, dumped, discarded, or disposed of as specified in Massachusetts General Laws, CHP. 21E. These sites are among the greatest threats to water supplies and should be monitored extremely closely. Water suppliers should work closely with local and state officials to develop control and cleanup procedures.

Unauthorized Activities - In large, often remote, watershed areas unauthorized activities can present the greatest threat to water supplies. Illegal dumping or disposal, especially of hazardous materials, can contaminate water supplies. Unauthorized trail or road development from hikers, anglers, horseback riders, mountain bikes or motorized uses, including moto-cross motorcycles or ATVs, can lead to erosion and sedimentation. Unauthorized motorized use also increases the potential of contamination from petroleum products. Illegal swimming, an especially attractive "nuisance" in uncrowded, pristine reservoirs can introduce pathogens to the water supply. Measures to discourage unauthorized use in watershed areas include: minimizing the development of new roads and other access sites in watershed areas; installing gates at necessary access sites; frequently and regularly patrolling and inspecting watersheds and reservoirs; posting clear and visible signs; and establishing and enforcing severe penalties for conducting the unauthorized activities.

Transportation and Roadway Related - The major threats to water quality from transportation, airports and other roadway-related uses are from roadway and parking lot run-off, storage and application of de-icing materials, accidental hazardous material spills, road maintenance, construction or reconstruction, and highway maintenance facilities. Urban run-off, including run-off from roadways and parking lots, is estimated by the DEP to account for approximately 50% of the non-point source pollution in Massachusetts.

Future Development - Undeveloped watershed areas are often attractive sites for future development, offering many scenic and other amenities desired by prospective residents. There may be long distances of road frontage in watershed areas, allowing the so-called "ANR," approval not required, development. Often, zoning, subdivision, or other regulations in rural towns where watersheds may be located have few environmental performance standards or safeguards. Any increase in residential development increases the threats to water supplies from a host of potential sources, including on-site sewage disposal, residential fuel storage, residential pesticide or fertilizer use, run-off, and the storage, use, and disposal of household hazardous material.

Worksheet to Assess Threats to Surface Water Supplies

This worksheet is designed to assist surface water suppliers in identifying which water quality threats might be present in watershed areas. It is meant to be a starting point to indicate how a control program should be shaped. The threats identified below should be quantified before control measures are implemented.

	Exists in watershed	Not present in watershed	Type of Control program in place	Comments
Naturally Occurring Attributes: Soil Erosion Wildlife Populations				
Man-Made Contamination Sources: Land Use: Commercial and Industrial Land Use Forestry Agriculture / Animal Rearing Residential Development				
Permitted Activities: Discharge to Water Hazardous Waste Solid Waste				
Sewage Disposal: Sewered Areas On-Site Sewage Disposal				
Petroleum Storage: Gasoline Stations Other Petroleum Storage				
Road Salt Road Salt Storage Road Salt Application				
Unauthorized Activities				
Transportation & Roadway Related Parking Lots Roadway Run-off Accidental Spills				
Future Development				

III. Summary of Regulatory Control Measures

Successful watershed protection programs use a foundation of local regulations to restrict, prohibit or control potentially harmful watershed land uses or activities. These measures are summarized below.

Water Supply Protection Zoning - In Massachusetts control of land use activities through land use regulations is primarily vested in the local communities. Zoning, as authorized under MGL CHP. 40a , the Zoning Enabling Act, is one of the most effective means available to local communities to prevent undesirable land uses in important resource areas, such as watersheds. A water supply protection zoning bylaw can prohibit potentially harmful land uses, such as gas stations, from identified water supply areas, can establish setbacks or buffer strips to surface waters, can restrict permitted land uses through performance standards, such as requiring stormwater control mechanisms, or give flexibility to permit granting authorities, such as Planning Boards, to set environmental standards for permitted developments through such procedures as special permits or site plan review.

Underground Storage Tank Bylaws / Regulations - Underground Storage Tank Bylaws / Regulations, either Board of Health Regulations or Town Bylaws, may require that underground tanks be registered, tested, or removed. The most stringent of these may require that tanks be prohibited outright, especially in watershed areas.

Septic System Regulations - Septic System Regulations, typically Boards of Health regulations, can impose additional requirements to Title 5 of the Environmental Code, the state regulations that govern on-site septic disposal.

Wetlands Bylaws - Wetlands Bylaws, typically Town bylaws, may extend responsibilities of Conservation Commissions beyond the Wetlands Protection Act. Wetlands bylaws may expand the jurisdictions of the Conservation Commissions to consider water resource issues, such as recharge and water quality. A local Wetlands Bylaw could also confer the authority to enforce the Wetlands Protection Act to the local Conservation Commissions.

Unregistered Motor Vehicle Bylaws - Unregistered Motor Vehicle Bylaws, which are typically adopted by Town Meeting, may require that unregistered vehicles be stored indoors in order to minimize the generation and transport of a contaminated leachate.

Hazardous Materials Bylaws - Hazardous Materials Bylaws, either Board of Health regulations or Town bylaws, can require that hazardous materials such as pesticides, herbicides or petroleum products be registered, require performance standards for the storage of these materials, and can impose strict penalties for illegal disposal of hazardous materials.

Flood Plain District Bylaws - Typically zoning bylaws, Flood Plain District Bylaws can prohibit development in flood plains or impose performance standards on development that is permitted in flood prone areas in order to protect water quality.

Earth Removal Bylaws - Earth Removal Bylaws, which can be zoning bylaws or town bylaws, can set performance standards for extractive operations, such as requiring all operations to be gated to prevent unauthorized activities, require that excavation not occur to close to groundwater or surface waters, require excavation not disrupt drainage patterns, or require stringent performance standards to control erosion.

Private Well Regulations - Private Well Regulations, which are typically issued by the Board of Health, can set well standards for the siting, installation, or abandonment of private wells, as well as water quality in wells. Considered a strong tool to protect groundwater supplies, Private Well Regulations are important tools to protect surface water supplies. Many surface waters are hydrologically connected to groundwater.

Floor Drain Regulations - Floor Drain Regulations, typically Board of Health Regulations, can prohibit the discharge of pollutants into floor drains, require that existing floor drains be sealed, connected to holding tanks, or connected to sanitary sewer lines.

Board of Health Regulations - See Septic System, Underground Storage Tank, Hazardous Materials, Private Well and Floor Drain Regulations above.

Worksheet to Assess Regulatory Control Measures to Protect Surface Water Supplies

This worksheet is designed to assist surface water supply personnel in determining if regulations are in place in communities within the watershed which could protect surface water supplies. It is meant to be a starting point to indicate where regulatory emphasis should be placed. A comprehensive surface water supply protection program will have a number of these control measures in place. This worksheet is to be completed for each community within the watershed, if the watershed extends across municipal bounds

Control measure	**In place in watershed community**	**Not in place in watershed community**
Water Supply Protection Zoning		
Underground Storage Tank Bylaw / Regulation		
Septic System Regulations		
Wetlands Bylaw		
Unregistered Motor Vehicle Bylaw		
Hazardous Materials Bylaw		
Flood Plain District Bylaw		
Earth Removal Bylaw		
Private Well Regulations		
Floor Drain Regulations		

IV. Summary of Non-Regulatory Control Measures

1. Setting up a Local "Adopt-a-Watershed" Program to Help Protect Municipal Water Supplies

What is an Adopt-A-Watershed Program?

A local "Adopt-A-Watershed" program is one approach that can be used to bolster a community's watershed management and protection efforts. These types of program can increase public awareness about protecting the water supply as well. A program like this recruits, trains, and supervises responsible community volunteers who regularly monitor watershed lands and report any potential threats to the appropriate authorities. In addition, volunteers involved in the program will increase public participation and awareness of water supply protection.

Why is an Adopt-A-Watershed Program Needed?

Communities with surface water supplies must protect and monitor the lands adjacent to the source waters (i.e., a stream or reservoir) to prevent pollution from entering those water supplies. Many communities purchase the land that surrounds the water supply source. These watershed lands are often located in remote areas and are susceptible to unauthorized and often illegal human activities, such as dumping or trespassing. In addition, wildlife populations, such as beaver and Canada geese, can affect surface water quality. Some of these activities may seem harmless, but can result in the degradation of a municipal drinking water supply.

In many cases, cities and towns do not have the resources available to monitor their watershed land as frequently or as thoroughly as needed to prevent potential contamination. An "Adopt-A-Watershed" program can extend the "eyes and ears" of a municipal water department to prevent possible incidences of contamination from occurring or worsening.

How Does a Community Set Up an Adopt-A-Watershed Program?

Communities that initiate an Adopt-A-Watershed program, should include several key elements and steps to ensure a well-planned and successful program. The following are some of the important steps that a community should take to set up an Adopt-A-Watershed program:

Step 1: Form a local working committee to provide direction to the program:

One of the key elements to a successful Adopt-A-Watershed program is a working committee or steering committee made up of community representatives to provide initial direction to and regular guidance of the project. These people should represent the public works or water department, the health board or department, the conservation commission, the selectboard, the police department, and other potentially interested community representatives. Close cooperation between municipal boards or departments is essential in order to address the needs of the different parties and not unduly burden one department or agency. It is important for communities that have watershed land in other towns to include representatives of those communities as well. The working committee may also want to seek the advice and support of local watershed associations, other water suppliers, and members of the community who have water supply expertise.

The following items should be addressed by the working committee to develop and manage an Adopt-A-Watershed program.

- Determine watershed area(s) or lands to be monitored;
- Identify problem areas that need immediate monitoring (such as reservoirs, known dumping areas, etc.);
- Determine the number of volunteers needed to survey the area(s);
- Identify groups or people in the community who would want to volunteer;

- Determine the level of monitoring the volunteers would be responsible for;
- Determine and provide for training of volunteers;
- Supervise the work of the volunteers;
- Determine a clearly stated process for volunteers to report possible sources of pollution.

Areas to be monitored should be based on past evidence of problems, susceptibility, access, and seasonal variations. For instance, illegal entrance to streams and reservoirs for swimming is a threat in the summer and will need intensive monitoring during June, July and August. Illegal dumping, however, is a year-round threat. Areas where dumping is likely, such as areas adjacent to roadways, should be regularly monitored throughout the year. Erosion problems, especially in steep slope areas should be regularly monitored, especially after severe storms.

Step 2: Recruit and train volunteers:

Recruiting and training volunteers is the most challenging, but vital, part of the program. An identified volunteer coordinator with time and interest to commit to the program will make it easier to find and keep volunteers in the program. Volunteers can be found by tapping into organizations like the Boy/Girl Scouts, local chapters of environmental groups, birding or hiking clubs, or already existing trails groups. Leaders of different groups or organizations should be contacted to see if they can suggest potential volunteers. It may be possible to enlist an entire chapter or club, such as a troop of scouts. Until a program is established it is not advisable to advertise to the general public for volunteers but better to work with a more manageable, known entity.

Volunteers should have the following skills or attributes prior to training: should maintain a minimal fitness level; should possess map reading and navigational skills; have minimal safety and first aid skills; be familiar with hiking preparation for the back woods; have basic plant and wildlife identification skills such as the ability to identify wetlands, mammals (i.e. beaver), or waterfowl; and have basic knowledge of the hydrological process and its contribution to erosion. Trustworthiness is probably one of the most important attributes of a volunteer. The last desired outcome of a volunteer monitoring program is to create more of a problem by introducing volunteers to a watershed area.

In addition to skills volunteers may bring to a program, volunteers should be trained to look for the traces of illegal dumping, trespass, erosion problems, excessive wildlife populations, and other potential hazards to the water supply. Using slide shows to show the different signs of contamination or activities is a good method for training volunteers. Private non-profit organizations, such as local land trusts or environmental groups, state or federal resource agencies, and other groups may be able to provide specialized training for volunteers. If the watershed is located in another town, town officials from those towns, such as the police chief, might be a good trainer.

Volunteers should also be provided with available background information about the watershed, such as maps showing watershed, property, and wetland boundaries, local bylaws, such as floodplain and watershed protection bylaws, that may restrict or mandate certain actions, and information about which municipal board or agency has responsibility for watershed land.

Volunteers should be directed to monitor specific locations at regular schedules. The exact size of the monitoring area and schedule will vary depending on a number of items including characteristics of the watershed, severity of the potential problem, season, and capabilities of volunteers. Volunteers should have maps that show the precise locations that they will be monitoring, preferably on U.S.G.S. topographical maps.

Step 3: Monitor volunteers

A clear procedure for reporting possible illegal or unauthorized activities should be established for volunteers to follow. It is important that volunteers map the location of the problem and estimate the magnitude of the problem. Equally important, volunteers should be instructed about who to notify. The person who receives notification of problems should be determined by the working or steering committee and could be the volunteer coordinator or other municipal official, such as the Water Department Superintendent. Reports by volunteers of problems or violations should be verified by the volunteer supervisor before enforcement or corrective action is taken.

Volunteers should be clearly instructed not to intervene if they should interrupt someone in an unauthorized or illegal act or activity.

A volunteer coordinator should oversee the schedule and activities of the volunteers, but the working committee should be available at regular intervals (about twice a year) to assist the volunteer coordinator.

2. Land Acquisition

Ownership of land, or ownership of interests in land through such means as conservation restrictions, offers the greatest degree of protection of watershed areas from undesirable land use activities.

a. MGL Chapter 61, 61A, and 61B Memoranda of Understanding to Secure Land

MGL CHPs. 61, 61A, and 61B authorize Massachusetts tax assessment programs which value land meeting specified forest, agricultural, or recreational use criteria on the use of the land rather than on its development potential. In return for lower tax assessments on lands enrolled in these programs, landowners grant to the city or town where the land is located a right of first refusal to acquire the land if the land is to be converted or sold to residential, commercial, or industrial use. The right of first refusal to acquire lands enrolled in these tax assessment programs is an important tool to expand watershed land.

Landowners of parcels enrolled in this program must notify the Selectmen, Assessors, Planning Board and Conservation Commission by certified mail if the use of the parcel by the landowner or by a prospective buyer is to changed. The Town then has 120 days to decide whether to exercise its option to buy the land. The Town also has the option of assigning its right of first refusal to a non-profit conservation group. The Town must inform the landowner of the town's intentions, regardless of whether the town decides to buy the land, assign its right to a non-profit conservation group, or not to exercise its right at all.

For this process to benefit watershed protection efforts, the watershed authorities must be aware of which parcels in their watershed are enrolled in the Chapter 61, 61A, and 61B programs. The water supplier must also inform selectmen and other town bodies of the supplier's interest in these parcels and must work out a process such that the supplier is notified of any impending change in use or ownership of the watershed parcels. Particularly when the watershed for surface water supplies is in a different town than the town using the water, it is important for watershed authorities to work closely and continuously with officials of the watershed town before and throughout the notification procedure. Because the watershed, or host, town can either buy the land itself or assign its right of first refusal to a non-profit conservation group, but cannot transfer that right to another town or to the water supplier, often a local land trust or other conservation group can act as intermediary between the host town and the water supplier. In this scenario, the host town would transfer its right of first refusal to the land trust. The land trust would then buy the land, with the understanding that the water supplier would then immediately buy the land from the land trust. It is in the interests of both communities and the land trust to draw up a memorandum of agreement spelling out the procedure for notification. The following is a draft memorandum of agreement between a host community (where the watershed is located) and the supply community (where the water is used). Note that this memorandum does not bind any of the parties to purchase of the land.

Draft Memorandum of Agreement

Whereas, (host community), under Massachusetts General Law Chapter 61, is notified by property owners within its jurisdiction when they are going to sell or convert property enrolled in a Chapter 61 program;

Whereas, (host community), under Massachusetts General Law Chapter 61, is entitled to right of first refusal on land taken out of a Chapter 61 program;

Whereas, (supply community) has a custodial interest in the source of its water supply, i.e., watershed land;

Whereas (land trust), under Chapter 61 is qualified to act on (host community's) behalf in the acquisition of lands under Chapter 61;

Whereas, (land trust) is qualified to act as intermediary between communities in the negotiations over Chapter 61 lands;

Now therefore, (host community) and (supply community) agree to the following:

When (host community and land trust) are notified about the potential sale or change in use of a Chapter 61 property located within the following areas: ______________________________________, the (land trust) will send notice to the Water Department in (supply community) by certified letter within 30 days of notification from the property owner.

This Memorandum may be rescinded or amended at any time, by mutual agreement of all parties.

This agreement will become effective upon the signing of each participant.

______________________________	____________
Representing (host community)	Date
______________________________	____________
Representing (supply community)	Date
______________________________	____________
Representing (land trust)	Date

b. Using Timber Harvest Revenue to Fund Land Acquisition

Often when a desirable parcel of land comes up for sale in a watershed, the ability of the water supplier to act quickly to acquire the land is hampered by the need for Town Meeting to approve funds. If a dedicated fund can be established prior to parcels coming on the market, the water supplier can use those funds to buy land in a timely manner. Revenue from timber harvests on water supplier-owned land can be earmarked for such a fund. Forest management plans can be adjusted to provide such revenue on a regular basis while still maintaining the primary priority of high water quality.

c. Claiming Owner-Unknown Land

In the remote areas which often serve as watersheds for public drinking waters there may be lands where the ownership is unclaimed or unknown, so-called owner-unknown land. Owner-unknown lands are those lands for which taxes are not received. A municipality, through a lengthy and sometimes expensive procedure, can claim such land and dedicate it to watershed protection, thus removing the threat of development. As this process is strictly regulated by state law, the steps below are only an outline of what is needed.

Step 1: Review tax maps to determine where the ownership is uncertain.

Step 2: Determine if this land is important for water supply protection.

Step 3: Contact the municipal Tax Collector, who oversees the process of claiming such land.

Step 4: Provide support for the Tax Collector, Selectboard, or other municipal bodies throughout the claiming process.

Because this technique may involve a legal remedy or challenge, sound legal advice, preferably from the Town Counsel, should be obtained before using this technique.

d. Working with Private Non-Profit Organizations to Facilitate Land Acquisition in Watershed Areas

Why It is Important for Water Suppliers to Work with Land Trusts

Acquisition of land, or an interest in land through such means as conservation restrictions, is the strongest measure water suppliers can take to control future use on watershed lands. Land trusts are non-profit organizations working to protect or preserve lands in undeveloped, open, or natural states. Land trusts can be valuable allies to water suppliers in developing and executing a land acquisition program. In the last decade a record number of land trusts have started in the country, particularly in New England. In Massachusetts alone there are over 100 land trusts. Land trust members can offer valuable time, expertise, resources, and experience to water suppliers to facilitate the acquisition of an important parcel of land.

How Water Suppliers and Land Trusts Can Work Together

Land trust members can work with water suppliers to help with the following steps:

- Identification of available property
  Land trusts usually have knowledge or maps of important resource areas. They may be able to identify lands which become available for sale more readily than water suppliers can. Water suppliers should contact local land trusts and ask for their cooperation in identifying parcels for sale within the watershed.

- Contribution of technical and financial assistance
  A land trust will usually be experienced in the technical aspects for acquiring land for conservation purposes and should be able to suggest options for protection beyond outright acquisition, such as conservation restrictions, leveraging of funds, or limited and well-planned development. A land trust will be able to explain the tax advantages of various options to the landowner. Additionally, a land trust may have the financial resources to buy a parcel in anticipation of the water supplier being able to buy that parcel. See the section on pre-acquisition of land, below.

- Negotiation with landowners
  Land trust personnel are usually experienced in negotiation with landowners and may be able to suggest ways to approach landowners who have not yet considered selling their land or development rights. Over-burdened water supplier personnel may find it easiest to allow the land trust to conduct time-consuming negotiations.

- Work with state agencies or other non-profit conservation groups
  If neither the water supplier nor the land trust are able to acquire a parcel or its development rights, the land trust will often have the time and contacts to find a state agency or other non-profit conservation organization (Massachusetts Audubon, The Trustees of Reservations, The Nature Conservancy, etc.) which is interested in acquiring or protecting land in the watershed.

- Pre-acquisition of land
  In many instances there may be a need for a landowner to transfer property quickly, for instance to realize end of the year tax benefits. Municipalities might not be able to act within the required time frame, perhaps needing town meeting or city council authorization for appropriation of funds. Land trusts can "pre-acquire" lands from private landowners for the water supplier, and then transfer the land to the municipality or water supplier once all the necessary approvals are in place. This insures that property is not sold for non-water supply protection purposes. In addition to outright pre-acquisition, land trusts may secure transferable options to purchase or purchase and sales agreements to "hold" the land until the water supplier gets necessary approvals. Once those approvals are in place the land trust then transfers the option to the water supplier.

- Outright acquisition
  If the water supplier is unable to acquire an important parcel in the watershed, a land trust may be able to step in and acquire the land for its own purposes. If the goals of the land trust are compatible with those of the water supplier, this alternative may provide protection for land which would otherwise pass into residential or commercial use.

3. *Emergency Planning for Hazardous Spills*

Communities that rely on surface or groundwater sources for their municipal water supplies have an additional worry in terms of hazardous spills within those supply areas. If hazardous materials flow or leach into any water supply source or tributary, it could spell disaster for the water supply. A toxic substance may be able to reach a water supply source in under an hour.

Preventive measures should be in place before a spill, including:

- Identifying vulnerable roadway discharge points, drainage systems and detention basins.
- Mapping these areas, so a spill can be contained at its source.
- Providing emergency response personnel with maps of vulnerable spots.
- Working with highway and public works officials to correct deficiencies.

Why is a Local "First Response" Plan Needed?

If a hazardous materials spill occurs, the local fire department must respond and, if possible, contain the spill. The local fire department must also notify the Department of Environmental Protection (DEP) who will inform the regional hazardous materials (“HazMat”) response team if the local fire department needs assistance. This series of events can take up to two hours depending on the distance some responders may have to travel.

Toxic spill response plans do not always take the extra precautions needed in sensitive water supply areas. In some cases, there is no notification of the water department or health department when there is a hazardous spill. Many local volunteer fire departments do not have the training or the equipment to even contain a major spill.

In order to prepare for potential spills in water supply areas, it is important for communities to set up a local "first response" plan and in some cases to work with neighboring communities.

How Does a Community Set Up a Local "First Response" Plan?

Hazardous material spills can flow fast and it is important to contain them as soon as possible. It is important in water supply areas for a trained "first responder" and the right equipment to be on the site as soon as possible to stop the spill from spreading.

Local communities with watershed areas may be better prepared for toxic spills if they:

- Purchase the appropriate equipment for spill containment in sensitive areas (individually or in concert with neighboring communities).
- Conduct training sessions for several first responders in the community.
- Conduct spill simulation exercises.
- Make "mutual aid agreements" with neighboring communities and/or local regional agencies that may have access to the appropriate training and equipment.

Mutual Aid Agreements

A mutual aid agreement can be made between neighboring communities or with regional agencies to address water supply protection when a hazardous spill occurs. To enact a mutual aid agreement, willing communities must draw up an agreement with a plan for how each member of the agreement will proceed when a hazardous spill occurs -- including assigning first responders with the appropriate training. The plan must list the equipment that will be available and where it will be located. Communities may want to purchase equipment as part of the agreement or share the equipment owned by one of the communities or agencies. It is important that local public officials sign the agreement and that it is approved by the Department of Environmental Protection and the regional "HazMat" team.

Prevention of Localized Spills or Contamination Due to Household Hazardous Waste

Another source of potential contamination to groundwater or surface water supplies is localized spills of household hazardous wastes like used oil, paints, cleaners, pesticides, and fertilizers. Spills can occur at or nearby homes which are located within a water supply area. Household hazardous waste can also be dumped illegally or unknowingly in sensitive areas.

A public education program informing people about what constitutes a household hazardous waste can be helpful in preventing many spills. A collection day, or a drop-off facility that is specially designed for hazardous waste, can substantially minimize releases of household hazardous wastes. Water suppliers can target homeowners and businesses in the watershed for special announcements of collection events. A regional household hazardous waste collection system between neighboring communities can be developed for water supply areas that cover different municipal boundaries.

4. Education Programs - Signs for Watershed Areas

Often people who live in a water supply watershed or drive through one on a daily basis do not know where the watershed boundaries are. Even if other educational outreach programs have alerted the public to the need for watershed protection, people need to know where the watershed is before they can put into practice any needed changes in their own behavior. The Division of Water Supply encourages municipalities to use an established sign type to identify their public water supply protection areas, so as to ensure consistency throughout the state. This sign, reproduced on the next page, has been used on Cape Cod and in the Barnes Aquifer area of western Massachusetts. Dimensions of the sign are 24 by 30 inches. Made of .080 aluminum, they are screen-printed blue, leaving white letters and border. In 1992, sixty signs cost $19.17 each and one hundred signs $18.60 each. Communities which used the sign have posted it on all the roads entering their water supply protection areas. For more information on the specifications of this sign, please contact either the Division of Water Supply at One Winter Street, Boston, MA 02108 (617-292-5770) or the Pioneer Valley Planning Commission, 26 Central Street, West Springfield, MA 01089 (413-781-6045).

DRINKING WATER SUPPLY AREA

Please protect it!

5. Adherence to Best Management Practices

The term Best Management Practices (BMPs) refers to a broad range of techniques and practices which are recognized to be the most effective and practical means to prevent or reduce water supply contamination. Included under the BMP definition are so-called structural measures, such as construction of a check dam to slow runoff, non-structural measures, such as leaving a "filter strip" adjacent to streams where no logging occurs to prevent erosion, and management practices, such as carrying absorbent material on heavy equipment to quickly contain a release of fluids from a line rupture. BMPs can and should be applied to most land uses and development situations. Best Management Practices can be considered for all practical purposes as "common sense" good land stewardship or good neighbor practices. For the most part Best Management Practices will not impede new development but only provide the framework for better development.

There are a number of useful BMP reference and guidance documents available for general use. One of the most comprehensive is "The Megamanual" developed by the Massachusetts Department of Environmental Protection. The BMPs recommended in that guidance document should be followed for all potentially hazardous land use activities in the watershed. This project explored two management practices important in watershed areas.

a. Special Forestry Practices for Water Supply Areas

Why are Special Forestry Practices Needed in Watershed Areas?

Timber harvesting can be the most damaging phase of forestry management for water supplies. Poor practices used during harvesting can result in erosion, which eventually causes sedimentation in surface water. Sedimentation is one of the major causes of water supply degradation.

Communities that own watershed land often contract with foresters and loggers to cut timber on water supply land. The forester and logger's forestry management operations must be a part of a forestry management plan that is reviewed and approved by the applicable county's state forester from the Massachusetts Department of Environmental Management.

Massachusetts General Law Chapter 132 Section 40-46 created a state forestry committee that developed the minimum forest cutting practices and guidelines for the state, which the state foresters enforce. These practices are the minimum standard, but do not necessarily take into account timber harvesting on watershed lands. Many municipalities and agencies who have experience in managing forests on watershed land have found that there are additional practices that should be followed to protect water quality.

What are the "Best Management Practices" for Forestry in Water Supply Areas?

There are many guidelines for forestry practices to protect water quality suggested by various organizations. Not all suggested methods are applicable to all watershed areas, and not all agencies, foresters, or loggers agree on each measure. The following practices are generally agreed upon and recommended by several communities and agencies with experience in managing watershed forests.

The watershed authority should:

- Identify all sensitive areas (including wetlands, streams, critical habitat areas, steep slopes, and archaeological sites) and map them. Maps of streams, Areas of Critical Environmental Concern and Priority Habitats, among many others, are available from MassGIS, Executive Office of Environmental Affairs, 20 Somerset St., Third Floor, Boston, MA 02108, 617-727-5227. Wetlands maps are available from the National Wetland Inventory.

- Make sure that all loggers are experienced in working in water supply areas, know the special constraints involved in working in these areas, and are made familiar with the locations of the sensitive areas.

- Conduct a review of areas prior to cutting and delineate the methods that should be used to prevent damage to those areas. Preventative measures include:
    - Specific guidelines for skid trails, access roads, landing, and stream crossing erosion control measures
    - Weight and size limits for equipment

- Make sure that forestry service providers prevent:
    - spills of hazardous substances (including fuel, oil, or lubricants),
    - leaks from vehicles,
    - litter from meals or cigarettes, etc.

- Provide (temporary) on-site sanitary facilities.

The following is an example of a contract between a watershed authority and a timber cutting bidder that delineates how forestry best management practices can be integrated into a contractual agreement:

Sample Contract for Timber Harvesting and Sale

The successful bidder agrees to cut and remove said marked timber in strict accordance with the following specifications:

A. CONTRACTUAL SPECIFICATIONS

1. To complete the logging (felling, skidding and piling) and/or sawmill operations on or before ________ excluding the months of April, May and June, when logging will not be permitted. (See Section C #8)

2. The purchaser must acquire a license to harvest forest products in accordance with the provision of Chapter 652 of the Acts of 1957 and must abide by the Forest Fire Laws and Cutting Practice Laws of the Commonwealth of Massachusetts. Extreme care shall be exercised by the purchaser and his employees against the starting and spread of fires.

3. In order to supervise this contract, all work will be done during the normal workweek. No work will be allowed on Sunday and the following public holidays: Memorial Day, July 4, Labor Day, Thanksgiving Day, and Christmas Day. All persons working on ________________ property will be off the property prior to sundown.

4. The contractor shall neither permit nor suffer the introduction or use of spirituous liquors upon or about the works embraced in this contract or upon any of the ground occupied by him.

5. No person shall carry on his person or transport in any vehicle, fire arms of any nature on the lands of ______________.

6. The contractor is responsible for the safekeeping of all access keys issued. These keys are for the sole purpose of conducting the timber sale contract. All access keys for this timber sale will be issued by ________'s authorized personnel and returned at the completion of this timber operation.

7. The contractor must display an access permit in all registered vehicles on this operation.

8. Access permits and keys must be returned at the completion of this timber operation before the performance bond will be returned.

9. The __________ Police will assist the ___________ for compliance with contract specification number A-3, 4,5; B-1; C-2.

B. WATER QUALITY SPECIFICATIONS

1. Since the area upon which the timber is located is a part of the watershed of a public water supply, extreme care must be taken at all times to provide proper sanitation, particularly as follows:

   a) No oils or fuels will be dumped on the watershed. All petroleum products shall be stored in safe, durable containers and will be removed from the watershed at the completion of each work day. Unattended fuels and oil storage must be in tanks designed, manufactured, and certified for commercial use. Oil absorbent pads and blankets will be required on site and with equipment to insure that any accidental spillage shall not pollute the environment. All waste materials including fuel, parts, machinery, lubricants, litter and other refuse shall be stored in appropriate containers and removed from ___________ watershed lands concurrent with the progress of the operation.

   b) The _____________ will be notified of any spills as soon as possible.

   c) Contractor shall be liable for all costs incurred resulting from the clean up of all spills and leakages of hazardous materials.

   d) Toilet facilities must consist of a portable, self-contained, leak-proof unit of three gallons or more. A durable, easy to empty, camping-type unit is required. All portable toilets must be emptied into a sanitary sewer system by way of a flush toilet. Contamination of the area by non-use of the portable toilet will be considered a breach of these conditions and cause for suspension of the operation.

   e) Working and lunching areas must be kept of sandwich wrappers, garbage and other litter.

C. LOGGING SPECIFICATIONS

1. The purchaser agrees to conduct the cutting and logging upon said property with as much care as possible, and in a proper, customary, and professional manner doing as little damage as possible. No liability shall be attached to the purchaser for any damage that may be said to be customary in logging timber.

   a) In tree length logging, logs will be cut to a maximum length of thirty-two (32') feet when deemed necessary by ________________.

   b) Logging ruts greater than 12" deep, measured from the natural contour will be filled. Ruts less than 12" deep will be filled and smoothed if they offer any potential for gullying.

   c) No slash or other debris is to be placed in any stream and the flow of any stream is not to be impeded in any way.

2. a) Log landings and cordwood landings must be approved by _____________. Log landings and cordwood landings are not to be used for retail customers. All log landings and cordwood landings will be restored to the forester's satisfaction at the completion of the logging operation.

   b) All machinery and structures used by the purchaser during the operation must be removed at the time of the completion of this timber operation. All firewood products piled on ______________ property must be removed within six (6) months after the completion date.

3. To remove only marked timber and to forfeit as a penalty, a sum equal to three times the stumpage volume for each unmarked tree, which is cut or damaged negligently. The purchaser shall not be liable for this penalty in falling unmarked trees in construction of skid roads, truck roads, log landings and mill sites on locations approved by the ________________.

4. All trees, including multiple stems, shall be cut close to the ground leaving the paint marks visible on the stumps.

5.
   a) On timber sale lots, all hardwood timber shall be utilized in their tops to a 10" diameter. The minimum log scaled is 8' in length, sound, with no more than 4" of sweep. All softwood timber shall be utilized in their tops to an 8" diameter. Cordwood trees and hardwood tops will be utilized to an 8" tip diameter, excluding those portions of the tree that are less than 12' n length.

   b) On cordwood lots, all softwood shall be utilized in their tops to an 8" diameter (see above). All hardwood trees greater than 6" DBH shall be utilized to a 3" tip diameter. Trees less than 6" DBH, if not utilized, must be cut and lopped.

   c) In pine plantation clear cuts, all softwood trees greater than 6" DBH will be utilized to a 4" tip diameter.

   d) In pine plantation thinnings, all softwood trees greater than 6" DBH will be utilized to a 4" tip diameter.

6. Unmarked trees and reproduction will be protected against unnecessary damages during logging operations. Logging slash shall be kept back at least twenty-five (25') feet from the center line of all existing fire access roads and streams. Wood roads shall be kept clear of brush and tops and skid roads will be marked and approved by ______________ prior to use. The logging methods necessary to meet our watershed and silvicultural objectives will require the following practices. Fully loaded skidders will be limited to the designated skid trails and all marked trees (4' tall to 5" DBH) will be cut.

7. All tops will be lopped, with a chainsaw, to the _________'s satisfaction to facilitate access and decomposition. All broken, uprooted and spring trees will also be cut and looped with a chainsaw. Maximum length of looped tops, broken, uprooted and spring trees shall be eight (8) feet.

8. In case of extreme dry weather or mud conditions, _______________ reserves the right to suspend this lumber operation, if necessary, and will extend the time for completion accordingly.

D. EQUIPMENT SPECIFICATIONS

1. ________________ will not be liable for injuries or damages occurring during the logging operation. Safety helmets, steel toed boots and chaps should be worn at all times.

2. Equipment on this lot will be limited to a maximum ground pressure of___ psi and a maximum width of ___ inches.

   Other: ___________required.

E. BIDDING AND BONDING SPECIFICATIONS

1. For a bid deposit, the bidder must forward a check in the amount of $500.00 if your bid is $500.00 or more, or for the full bid amount if your bid is under $500.00, along with their bid proposal to __________________.

The check must be made payable to both ______________ and the bidder, and written in the following manner:

EXAMPLE: **Pay to the order of: "______________ or John Doe Lumber "**

As the unsuccessful bidders will have their check returned soon after ______________ awards the contract, the check must be written as above, so that either party will be able to cash this check. The successful bidder will be notified immediately after the bid opening by ______________'s Forester or Agent. Upon acceptance, by ______________, of the successful bidder, the bid deposit will become non-refundable. The remaining balance of the bid price must be paid before the start of any cutting operations or by __________ whichever comes first. The remaining balance payment must be certified personal or certified company check, bank or cashier check, or money order, payable to ________________.

2. For a "Performance Bond" we will require a $500.00 certified personal or certified company check, bank or cashier check, or money order, to be made payable as per example above, and forwarded to ________________. The Performance Bond is required to assure compliance with the terms of this contract. The amount reflects the value of the contract as well as the potential for damage to ___________ 's lands, and in no case will the amount be less than five hundred dollars ($500.00). Upon SUCCESSFUL COMPLETION of the timber operation and the return of access permits and keys, your performance bond will be returned.

   FAILURE TO COMPLY WITH ANY CONDITIONS OF THIS CONTRACT WILL BE CAUSE FOR SUSPENSION OF THE OPERATION AND/OR TERMINATION OF THE CONTRACT.

(Courtesy of the Metropolitan District Commission -- Division of Watershed Management -- Quabbin Reservoir)

b. Best Management Practices for Road Deicing to Protect Public Water Supplies

How Can Road Deicing Affect Water Supplies?

Many road deicing and snow removal practices solve one problem -- hazardous road conditions -- and contribute to another -- contaminated water supplies. Road deicers usually contain salts which can be hazardous to health when they exceed certain levels in drinking water supplies. Deicing chemicals can also cause other pollutants to leach into water supplies.

Road deicers can enter water supplies by mixing with road runoff which may splash or flow directly into a surface water or groundwater source. Snow melt into roadside ditches, or dumping of snow or sand debris from a road's surface in sensitive areas, can also cause contamination of water supplies.

Best management practices (BMPs) have been developed that reduce the formation of polluted runoff from road deicers and help to prevent contamination from snow removal and street sweeping.

What are the Best Management Practices for Road Deicing?

BMPs for road deicing include alternatives to salt, reduced salt policies, improved snow plowing and dumping techniques, and enhanced street sweeping. These BMPs are described below:

Deicing BMPs

- Reduced Salt Use - The most common road deicing approach is the application of a sand/salt mixture that provides traction and prevents ice buildup. The salts usually used are sodium chloride ($NaCl$), potassium chloride (KCl), and/or calcium chloride ($CaCl$).

  The amount of sand to salt in the mixture varies from town to town and road to road depending on level of service needed. In sensitive locations, a higher salt content in the mixture often results in sodium or chloride leaching into a surface water or groundwater supply source.

  The BMP for salt use is generally a high sand to salt ratio (between 4:1 - 20:1). This range depends on road type, level of service, and storm conditions. Sodium can be further reduced by using a mix of salts (four parts $NaCl$ to one part $CaCl$ or potassium chloride - KCl) and then a higher ratio of sand to the mixture of salts. Liquid calcium chloride may also be effective. Calcium and potassium have not been considered contaminants in water supplies.

  The following initial steps are recommended:

  - Cities and towns must determine the locations of their water supply resources and then map the boundaries of sensitive areas.

  - Communities should develop and adopt a municipal road salt policy with the help of the Health Board, Public Works Department, Selectboard and other boards who may be able to identify sensitive resource areas. Each of these boards or departments will be instrumental in building public awareness (including posting reduced salt roads) and implementing the specifics of a road salt policy -- from storing the salt to more careful spreading to monitoring the water supply quality.

- Alternatives to Salt Use - There are other substances available that can de-ice a road's surface.

  Calcium Magnesium Acetate (CMA) can be used for road deicing. It is not a salt and does not have known detrimental effects on a water supply. Sand must be used along with CMA to provide traction. Some complaints about CMA are that it is more expensive than salt and it is a more difficult substance to manage prior to use and when plowing.

  Verglimit - Verglimit is a substance infused with calcium chloride and then mixed into the road's top-course as the road itself is being surfaced. As traffic goes over the road, it wears the surface and causes the CaCl to be exposed, preventing snow and ice from forming on the road. Verglimit has been known to facilitate snowplowing and does not release sodium runoff. Complaints about Verglimit have been that it is expensive and often needs additional deicing materials applied.

Road Salt Storage BMPs

Road salt storage is an important part of protecting a community's water supply. If salt is exposed to the elements, it will mix with water to create runoff. If salt storage is located near any groundwater or surface water supply source, then the runoff may contaminate the water supply. There are a few ways to prevent salt from leaching from storage -- these are described below:

- Shed storage - A storage shed is necessary for salt storage to prevent direct exposure to rain, snow and wind. It has been found that storage sheds prevent waste of the salt supply as well.

- Impervious surface - In addition to a storage shed, it is a best management practice to build the salt storage area on an impervious surface so that salt and other substances cannot leach into groundwater.

- Brine (salt water solution) collection system - Along with an impervious surface, the salt storage area should have a drainage system which collects all runoff, allows evaporation of water and permits re-use of the salt.

- Berms - Another best management practice for road deicing materials storage is the construction of berms around the entire site to prevent any runoff from leaving the site.

Snow Plowing and Dumping BMPs

- Snow plowing practices are an important part of water supply protection. As roads are plowed, the snow can be filled with deicing materials and should be handled as a potential pollutant. The snow should be plowed to locations where it can melt into a drainage system that will prevent it from leaching into a surface water or groundwater supply source.

- Snow dumping practices are also important in protecting a water supply. Communities should consider snow removed from roads as a potential pollutant. The snow should be dumped in a location outside the Zone A of the watershed that has a sufficient drainage system or infiltration capacity to prevent the snow melt from directly flowing into a surface water or groundwater supply source.

Street Sweeping BMPs

- Street sweeping can prevent a large percentage of leftover road deicing materials from entering a water supply source. Conventional street sweepers catch some of the deicing debris, but an upgraded "sweeper" that actually vacuums rather than sweeps will have the best results, particularly in water supply areas.

6. Improved Enforcement - Non-Criminal Disposition Ticketing Authority

Bylaws and regulations aimed at preserving water quality in a watershed will have little effect if they are not enforced. Most Massachusetts communities enforce their bylaws and regulations through a criminal complaint procedure in district court. However, this criminal procedure is expensive and time-consuming for the community and is usually reserved only as a last resort in extreme or blatant cases. Often the real result of using the criminal complaint procedure to enforce bylaws and regulations is that those bylaws and regulations are not enforced at all.

An alternative to the criminal complaint procedure is non-criminal, or civil, disposition of bylaw and regulation violations. M.G.L. Chapter 40, Section 21D, authorizes communities to use non-criminal dispositions. This procedure allows communities to enforce bylaws and regulations by writing a "ticket" for the violation. Generally, the violator is first notified by letter of the violation and given a period of time (often 21 days) to comply. If after that period the violator is still in non-compliance, the "ticket" is issued. The violator then has the options of either paying a specified fine (generally in the range for $50 to $100 for each day of violation) to the Town Clerk or of requesting a hearing in district court. Because most violators will opt for paying the fine, the community is spared the expense and time of going to court.

To use this procedure, a community must adopt both a general town bylaw permitting non-criminal disposition enforcement procedures and specific zoning or other regulations defining the violations enforceable by non-criminal disposition, as well as setting the fines and deciding who will enforce the bylaws or regulations. If a community has specific zoning bylaws, board of health regulations, or other rules governing activities in watersheds, those rules can be amended to allow enforcement of the rules by the zoning enforcement officer, the health agent or other appropriate officials. Usually a community reserves the right to enforce rules by the criminal complaint procedure in addition to non-criminal disposition.

Watershed authorities can provide technical assistance and educational materials to communities to encourage them to adopt non-criminal disposition, as well as specific guidance to the enforcing officials on possible violations in the watershed. Sample general town bylaws and zoning bylaws are provided below. Communities should solicit the opinions of all involved town bodies, as well as their town counsel, in considering adoption of non-criminal disposition.

Sample General Town Bylaw Permitting Non-criminal Disposition Enforcement Procedures

ARTICLE xxx - PENALTIES

Section 1. Criminal Complaint

Whoever violates any of the provisions of the General Bylaws of the Town of ________ whereby any act or thing is enjoined or prohibited, shall, unless other provision is expressly made, be penalized by the indictment or criminal complaint brought in the District court. The penalty shall not exceed a maximum fine of three hundred dollars ($300.00) per violation or offense, unless otherwise allowed by law.

Section 2. Non-Criminal Disposition

Whoever violates any provision of the General Bylaws of the Town of __________ listed below, the violation of which is subject to a specific penalty, may be penalized by a non-criminal disposition as provided in the Massachusetts General Laws, Chapter 40, Section 21D. The non-criminal method may also used pursuant to this article for violations of any rule or regulation of any municipal officer, board, or department.

The following bylaws and sections of bylaws are to be included within the scope of this article and the specific penalties listed here shall apply in such cases. In addition to police officers, who shall in all cases be considered enforcing persons for the purpose of this provision, the municipal personnel listed for each subsection shall be the enforcing persons for such sections. Each day on which any violation exists shall be deemed to be a separate offense.

ZONING BYLAW: Section xxx: Watershed Protection Overlay District

Fine Allowed:	$75.00
Enforcement Agent:	Zoning Enforcement Officer
Fine Schedule:	$75.00

Section 3. Any person found to be in violation of any provisions of these bylaws shall be served by the Town of __________ with a written notice stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violations.

Section 4. Any person in violation of any of the provisions of these bylaws shall become liable to the Town for any expense, loss, or damage occasioned the Town by reason of such violation.

Sample Zoning Bylaw Permitting Non-Criminal Disposition Zoning Enforcement

ARTICLE xxx - PENALTIES

Any persons violating any of the provisions of this Bylaw, the conditions of a permit granted under this Bylaw or any decisions rendered by the Zoning Board of Appeals or the Planning Board shall be liable to a fine of not more than one hundred dollars ($100.00) for each violation, any such fines to be enforceable through the Superior Court or the Housing Court. Each day such violation continues shall constitute a separate offense.

In addition to the procedures for enforcement described above, the provisions of this Bylaw, the conditions of a permit granted under this Bylaw, or any decisions rendered by the Zoning Board of Appeals or the Planning Board under this Bylaw, may be enforced by the Zoning Enforcement Officer, by non-criminal complaint pursuant to the provisions of Massachusetts General Law, Chapter 40, Section 21D. The fine for any violation disposed of through this procedure shall be ($50.00) for each offense. Each day such violation continues shall be deemed a separate offense.

Prior to the imposition of any fine for a non-criminal complaint, written notice of the nature of the violation shall be given to the person or persons against whom the fine is to imposed. Said notice shall state the first date upon which a fine shall be imposed for a continuing violation of this Bylaw, which date shall not be less than fourteen (14) days from receipt of said notice and which shall contain reference to each specific Section of the Bylaw which is being violated together with a statement of the penalty for said violation.